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BUBONIC PLAGUE IN CUBA

BY

DR. JUAN GUITERAS

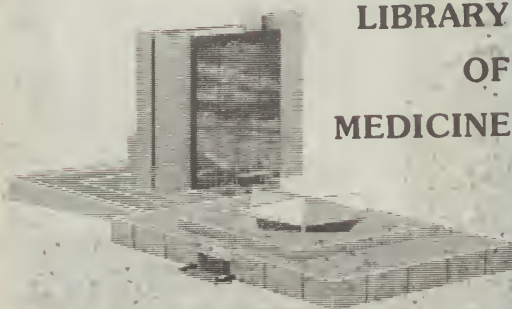
DIRECTOR OF HEALTH



HAVANA

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OBISPO 129 TO 139
1915

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DR. JUAN GUITERAS

Director of Health

Plague reappeared in Havana in February of this year 1914. The last case previously reported was on the 13th. of July of 1912. At that time we had three cases, but failed to find any infected rats. We kept up the examination of rodents during the rest of 1912 and part of 1913 without finding any infected. As the cases of human plague had been so few, and as they appeared within a very short radius, we were inclined to believe that the infection had been extinguished, though we still continued to look out for suspicious cases.

As a result of our continued vigilance and sustained interest in these matters, we were at once informed, through Dr. Julio Arteaga, of the occurrence of an unusual mortality of rats early in February of the current year, and in the same locality where the human infection was located in 1912. For this reason we maintain that the present outbreak is a recrudescence of the former one; the infection having been kept up in a latent form in the murine population. This view is further supported by the fact that we were keeping careful watch upon all possible sources of importation, including the Canary Islands, from whence the disease had been introduced in 1912 as a result of the concealment practiced by sanitary authorities there.

We wish to insist upon this last statement with a view to complete the history of the introduction of plague in Cuba. At that time (1912), we had been more than a year under serious apprehension endeavoring to ascertain the actual situation in those Islands, without hurting the susceptibilities of the Spanish authorities. The latter stoutly persisted in their policy of concealment, though these same Canary Islands had been the victims of the same policy practiced by Barcelona during the plague outbreak there in 1906. For these reasons, our quarantine measures against the Canaries had been incomplete and inconstant, and at the time of the outbreak in 1912, we maintained no restrictions.

Our suspicions that the plague infection of 1912 might have been imported from Porto Rico were soon dissipated by the conviction that we had been informed in good time of the appearance of plague in that island, and that it was too early to admit the probabilities of a propagation from that source. This opinion was further strengthened by the fact that the infection did not show itself in the neighborhood of the Herrera wharves where the Porto Rico boats tie and discharge their cargo, but in the neighborhood of the Caballería wharves, twelve blocks distant, and precisely where the sailing vessels from the Canaries

tie and remain for weeks selling and discharging their dangerous cargo of onions, potatoes and garlic.

We cannot say that there is any absolute proof of the importation of plague from these vessels, but that this is the most plausible explanation of the lamentable accident.

At any rate our protest against the conduct of the Spanish Government must stand, because they refused to inform us of the existence of plague in Barcelona in 1906, and in the Canaries in 1907 and subsequent years, and of cholera in Catalonia in 1911. Our object in making these statements is strictly educational.

We point out these misdoings with a view to upholding the principles upon which international sanitary agreements are based. We combat an unwholesome policy, and we are grieved as much as anyone if the good name of the Spanish government does not appear in a favorable light in these transactions.

From the 22nd. of February to the 20th. of June we have had in Havana 25 cases of bubonic plague, and 2 cases in neighboring towns which received their food supplies directly from Havana: a total of 27 cases with 6 deaths. Today, the 1st. of December, it is over five months since the last invasion, and we are in hopes that the outbreak is extinguished.

On June 22nd. the disease appeared in Santiago, probably imported with rats in the cargoes of foodstuffs from Havana. We have had there 11 cases and 5 in the neighboring country settlement el Aceite and town of Caney: a total of 16 cases with 4 deaths. The last case occurred on the 13th. of September, over two months ago.

In the month of April we found two plague rats in Havana, and in the month of July, 3 were found in Santiago. No other infected rats have been found though we have examined over 25,000 in Havana, and 1,048 in Santiago.

Our system of exterior defences may have been ineffective in 1912 on account of the information withheld by the authorities in the Canary Islands, but it can not be denied that the results obtained in the campaign against the infection have been satisfactory, both with respect to the control of the propagation, and to the case mortality.

We attribute both favorable results to one common cause, chiefly. This is the early recognition of every focus. Whether it be a human case or whether it be a focus of rodent mortality, there are, with us, a series of circumstances which tend to give the alarm without delay. These circumstances are: 1st. the general interest of the medical profession which is at one with the Sanitary Department in its national and patriotic endeavors, and is proud of its success; 2nd. the national Sanitary organization branching throughout the country, from the central directing power. This organization consists of one hundred and eight Health Offices, with corresponding medical officers, and the adequate personnel and appliances, all paid and controlled by the State Department of Health and Charities; 3rd. the organization especially developed within the same system for the city of Havana, which is, naturally, the place of greatest danger; and 4th. the very interesting mechanism of the *regional institutions*, private hospitals maintained by societies formed by natives of several regions or provinces of Spain. The numerous immigrants, laborers and clerks are subscribers to these

tion; they are not contagious in the usual sence of this term. This is true enough: the case is not in itself a focus of propagation; but it certainly points out the existence of such a focus.

We have thus been able to attack every focus in the beginning, without ever having had a reproduction of the disease in the same building after treatment with hydrocyanic acid, nor is there any evidence of scattering or propagation of the disease at a distance as a result of the treatment.

Several deductions may be made from these facts.

We have said that the patient indicates the focus of infection. In our epidemic it may be asserted that this focus was always to be found in the place of work, never at the domicile when the latter was distinet from said place of work. In 16 out of the 43 cases treated in Havana and Santiago, the domicile was more or less diatant from the place of work. In these 16 cases the family and other codwellers remained free from the disease, though these houses were generally treated more as a matter of form. The patient himself never established a focus of propagation in the dwelling though some of them remained two, three and even seven days in the domicile before suspicions were aroused as to the nature of the disease and the patient was removed to hospital, nor was there a single case of propagation in the hospitals.

It is well to insist upon these facts in behalf of the general discipline in the management of the epidemic. The notion is widely spread that the disease is highly contagious and in some communities patients have been abandoned, or there is a great deal of unnecessary and troublesome excitement produced around a case of plague. For this reason, instructions were given, early in the epidemic, to the local health officers, that patients should be moved without fear, after a cleansing or bichloride bath, and change of clothing, to the place most suitable for management and treatment. I had an opportunity of giving and object lesson in this direction by removing the patient at San José de las Lajas, in my own motor car, to Las Animas Hospital in Havana.

We insist then upon the importance of the early recognition and frank declaration of every focus, and its prompt treatment by hydrocyanic acid, following the proceedure employed by us; covering the building and those immediately adjoining with canvass, and fumigating then all at the same time. The rat holes are subsequently injected likewise with hydrocyanic acid. I leave to those who so aptly and dexterously developed the details of this proces to describe it; but would add here that hydrocyanic acid does not give rats time even to get to their runs. The gas destroys also the fleas as we have shown by witnesses exposed in favorable conditions, in bréeding jars containing earth for their protection.

I notice in some quarters a tendency to minimize the importance of the fumigation of buildings. I believe this is founded on the undue importance attached to the migration of rats in the propagation of plague. It is said that fumigation will scatter the rodents.

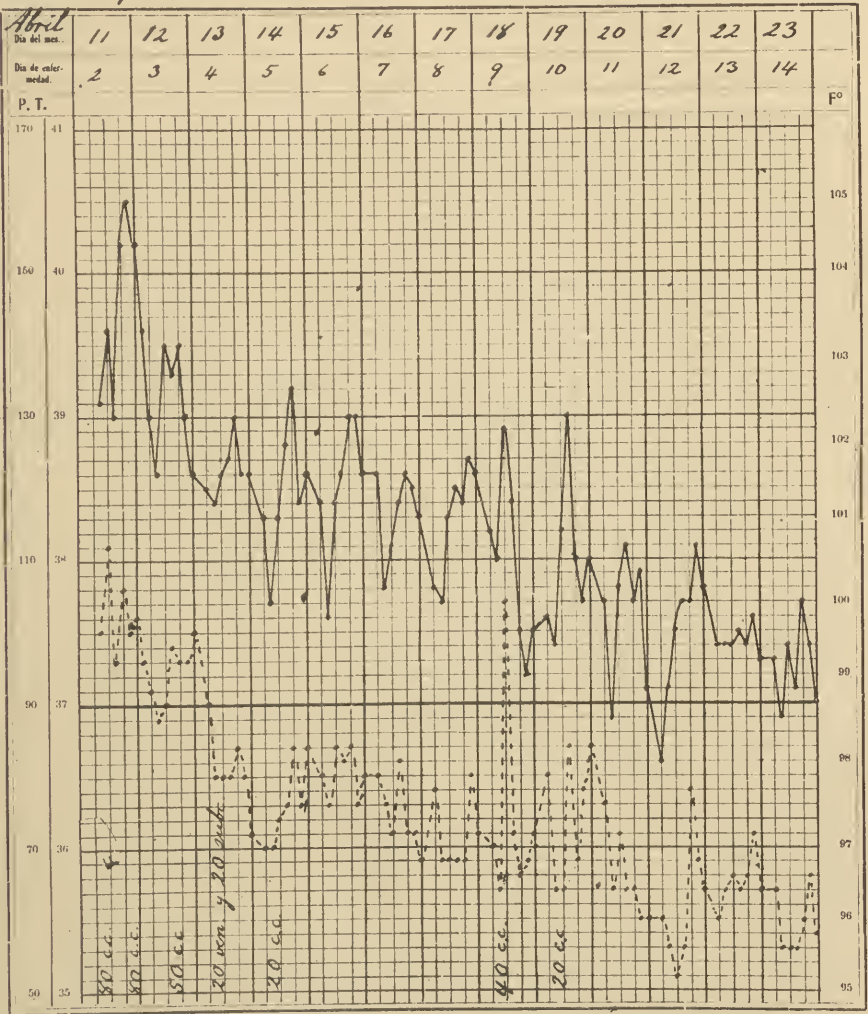
Our experience, indeed, is not great, but we are not able, here in Cuba, to point to a single instance of propagation of plague, at a distance, by wandering or migrating rodents. In our experience plague rats have been carried in mer-

chandise or infected fleas in sacking. It may be that in fumigating N.º 116 San Ignacio st. with sulphur, we may have driven an infected rat next door, N.º 114.

I can understand propagation by migrating rats where there is an extensive infection of rodents, but it is not easy to imagine, in a populous city, a rat

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Hospital Las Animas.

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CHART N.º 7

moving across numerous streets, lined with foodstuffs stores and dwellings, to carry the infection at a distance. The possibility is more acceptable within a short radius or in the same block of houses; but certainly the probabilities must diminish in relation with the distance.

Our closed and separate system of sewers has not favored this migration and the areas of underground rain water drainage are limited.

Wherever the plague appeared here in secondary foci, at distances above three blocks, and even at shorter distances, it was to be traced to the transport of merchandise or other objects, from infected places. Whenever a case appeared in one of the wholesale stores of foodstuffs—and these were always the primary foci—the unavoidable tendency was to dispose of as much of the merchandise as was possible, before the sanitary authorities could order the closure of the establishment.

Thus in Artemisa, at 50 kilometres from Havana the infection appeared in a foodstuffs store which received merchandise from the infected zone in Havana. The owners saw a sickly looking rat come out of the store into the yard and killed it. On noticing that the rat was covered with fleas they poured alcohol upon it and burnt it. Within five days one of the owners was taken sick with plague. After very thorough disinfection of the place with sulphur dioxide under cover of canvass, no other case occurred, nor was there any evidence of rodent infection.

The same may be said of the murine infection at Jaruco, (40 kilometres from Havana). Here the disease was limited to rats within the store room of the railroad station where foodstuffs and other merchandise, principally from Havana, were stored. The building was an isolated structure of corrugated iron upon a solid high basement of concrete. The fumigation of the building with hydrocyanic acid under canvass cover put an end to the infection, without the production of human cases.

The same conclusions may be drawn from the study of the intense focus of infection at the Street Department stables at Figueras St. some 20 blocks from the original focus of infection. The most reasonable explanation of this event is the importation of infected rats in the forrage from the large stores in the infected area of the city. Another acceptable explanation is that used sacks, with fleas, may have been carried in the street sweepers cars from the infected zone to the stable. An old sack upon the seat of the car is considered by these men as indispensable. It is also not unreasonable to suppose that dead rats being thrown with the street sweepings and garbage upon the carts, may have left in them infected fleas.

Fives cases occurred here in rapid succession out of more than a 1,000 men employed in different capacities in these large store houses, offices, stables and wheelwright's shops. The men infected were among those that were more closely connected with the horses, the forrage and the carts. Two of them had not been in the infected zones. Two infected rats were captured in these stables. The buildings with their contents were destroyed by fire and the infection ceased.

Any one of these suggestions is more reasonable than to imagine the movement of rats over these twenty blocks of houses, through the most busy sections of the city, and without producing intermediary foci.

At a greater distance still from the original focus, and in another direction, two cases appeared in a large baker's shops. There was a large stable annexed, and forrage was bought from the infected section of the city.

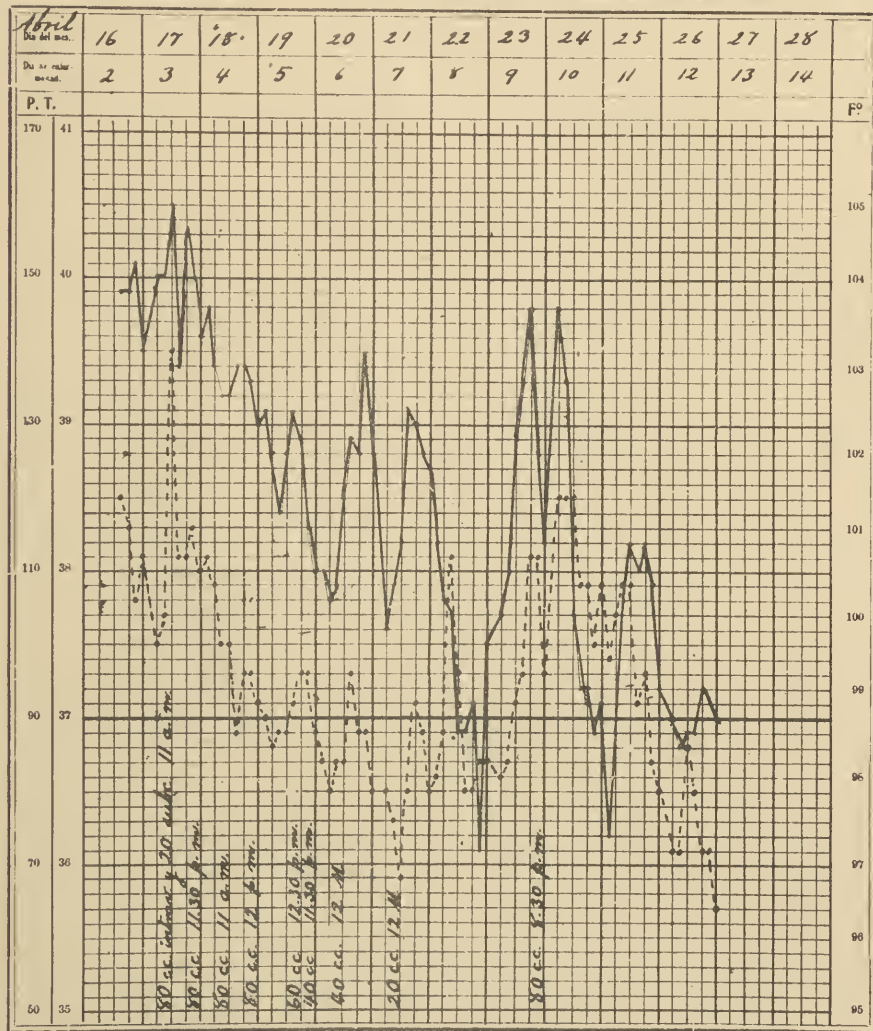
Another case at a distance occurred at Concha 2. This was a blacksmith's

shop with stable and veterinary establishment annexed. The forrage was furnished by the several owners of animals under treatment.

All the foci of infection at a distance from the original centre have been

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Hospital Las Animas

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CHART N.º 10

stables, foodstuffs depots or bakeries, and there never was any evidence of intermediary links.

Under such circumstances it was logical to conclude that the closure of a large number of wholesale stores would stop this sporadic outcropping. With this view 17 blocks of houses about the original focus were closed to business

and fumigated and treated block by block. The measure contributed greatly to the final extinction of the outbreak.

Similar considerations would apply to the two cases in the military barracks at Santiago. The two patients were corporals who handled the quartermaster's stores and slept close to the same.

The cases at el Aceite, about 12 kilometres from Santiago are another illustration. Here we have a country store, a school house and a small farm house. Three cases occur in the family of the grocer and one in a frequenter of the store who lived with his family in the house about 30 metres distant. The store had been supplied from stores in Santiago, one of them certainly infected. An infected rat is found in the farm house. Here, in the open country and at such short distance there can be no doubt of the migration of the rat from the store. The early discovery of the first case in el Aceite enabled us to extinguish this focus which threatened to be of great intensity, four persons having been rapidly infected before the measures were taken. These consisted in fumigation under canvass of the houses and also of a dry well where a large number of rats were killed. The chaparral around the houses was cut and burnt, and poisoned bait was scattered freely. As in all the other instances no secondary cases developed in these houses.

The results obtained in all these sporadic outbreaks are highly satisfactory and I take pleasure in mentioning the names of those who contributed to this success.

In Artemisa, Jaruco and San José de las Lajas the campaign was conducted by Dr. Fernando Plazaola and in el Aceite by Dr. Florencio Villuendas. In Havana and Santiago the local health officers Drs. José A. López del Valle and Antonio Illas met their great responsibilities with unusual effort and ability. The subaltern personnel everywhere was worthy of the highest praise. More exposed perhaps than any, efficient, and able, were the members of the bacteriological staff, Drs. Lebreto, Recio, Martínez and Cruz. Special mention should be made of Drs. Moas and García Mon of the private hospital La Concepción. Dr. March of La Cavadonga, Dr. Ortiz of Santiago, Dr. Caignet of Caney, and Dr. Pérez Chaumont for the prompt recognition and reporting of cases. But there is no physician among those who had any connexion with this trying work to whom this office is not desirous of expressing the most heartfelt gratitude. The same should be stated with reference to the public in general, the Press, and the merchants especially who were being seriously affected in their interests; all, with very few and rather disgraceful exceptions, lent their valuable aid.

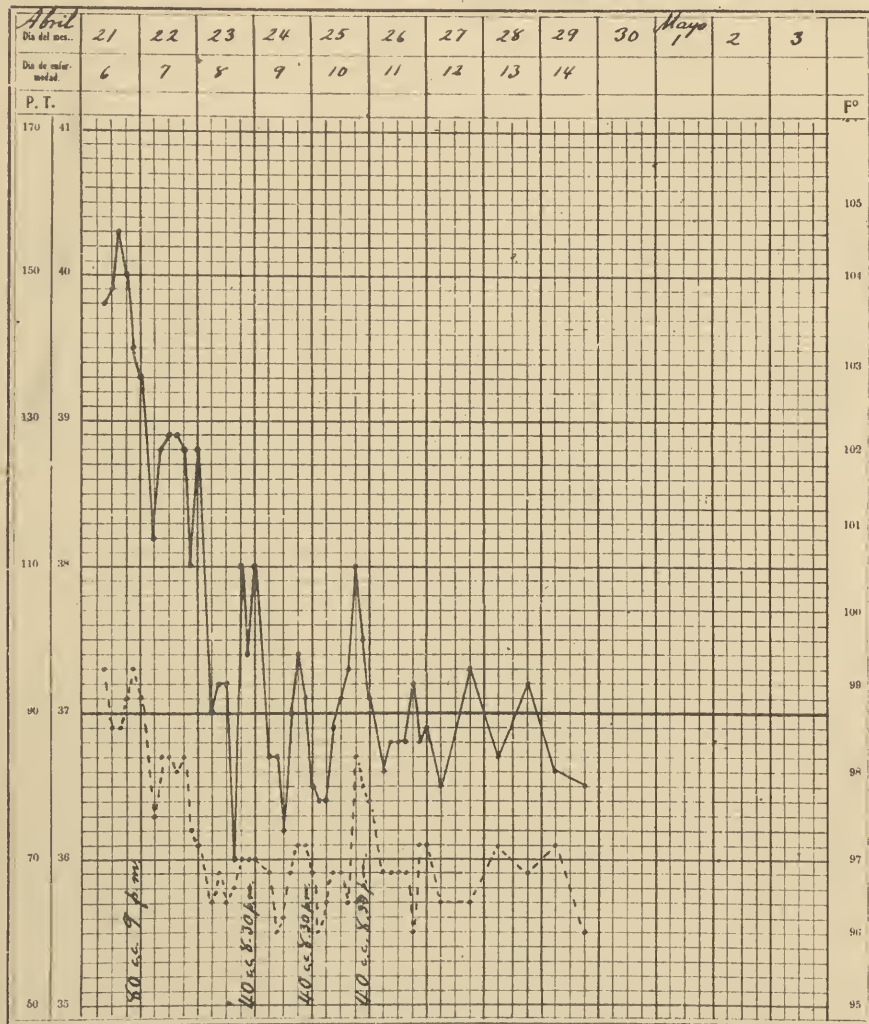
I have referred in the course of this paper to the conveyance of infection by fleas in sacking. Some observers in Havana were, at first, inclined to attribute the importation of plague to cargos of rice and bales of sacking from India. The London Lancet erroneously stated that I had advanced this suggestion. The truth is that I have maintained that this is a rather frequent means of conveyance, but only within short distances. An infected rat will leave, when it dies, a number of fleas in the sacking, where these insects find, for the time being, a favorable resort; and the conveyance of them in the sacks can be readily imagined. Naturally, however, in the course of days, and in the transport over distances, these fleas lose their infectivity and become disseminated, besides; so :

that the charge of infection does not reach the new locality in the concentrated form it had at the beginning. The probabilities of a successful transmission of the infection must diminish therefore in proportion with the distance of the transport in space and time.

For this reason, among others, I held the theory of the importation from India to be highly improbable. Rice is distributed throughout the world from

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CHART N.º 12

that distant country, and constitutes a great source of revenue. The English have been very careful to safeguard, from a sanitary viewpoint, this important trade. The result has been that no ships that enter Havana are

more free from ratas, and in better sanitary condition, than those that bring this kind of merchandise to our port. The trip is a long one (the cargos often come by the way of Liverpool) and no cases of plague occur on board.

It was very evident, besides, that our outbreak of plague had not occurred in the neighborhood of the wharves where these stuffs are landed and stored (the San José wharves), but at a great distance from them, near the Caballería wharves.

I decided, however, to subject this matter to an experimental demonstration, and I allowed fourteen guinea pigs to remain during ten days among the stored rice and sacking at the San José wharves. These pigs were then removed, and after keeping them seven days longer under observation they were killed and examined macroscopically and bacteriologically without finding any evidence of plague.

A very striking proof of the transmission of plague by sacking is shown in the case of house N.º 114 San Ignacio, where three cases occurred in the same day. The establishment was a storeroom and distribution centre for sacking, both new sacks in bales, and used sacks which were gathered from diverse sections of the city and resold from this establishment. The three cases that developed here were, two of them, draymen engaged in collecting the sacks from all kinds of shops and stores where they were sold second hand, and the third case was a boy who received the sacks and looked them over for repairs. This was a septicaemic case of extreme violence.

There were no foodstuffs stored in this place and very few rats were found dead after fumigation. The place, however, was proven to be infected by the guinea pig test, before treatment of the premises.

As a result of the above lesson we exercised careful control over the trade in used sacks, we established stations for their fumigation, and we disinfected with hydrocyanic acid all stores of this kind, whether they showed evidences of infection or not.

Another line of investigation was suggested by the sacking problem, namely, the study of the action of charcoal dust upon fleas. The trade in charcoal is carried on exclusively in second hand sacking. It became important to determine whether coal dust was favorable to the breeding of fleas. To this end I had the dry earth at the bottom of one of the breeding jars separated by a low partition into two halves, in one of which the earth was mixed with charcoal dust. The fleas transferred to this jar rapidly abandoned the side containing coal dust. A similar result was obtained when tobacco dust or cuttings were mixed with the earth. No cases of plague were found in charcoal stores or tobacco warehouses. One patient in Santiago was a cigar maker, but the factory was on the second floor of a foodstuffs warehouse in which one case had occurred.

I proceed now to mention two observations that do not fit in the general line of argument I have been following, but which may prove interesting from the viewpoint of the epidemiology and prophylaxis of the disease.

The patients were infected in the day time, during working hours, not in bed. There never was any evidence of infection in the domiciles where these were found in buildings distinct from the working place. Where the sleeping quarters were in the same building with the working place, the latter was, of

The sandal lends itself especially to the invasion of fleas. A great protection would be afforded by finding a suitable substitute to the hempen sandal, the *alpargata*.

The second observation I wish to point out is that we have had no cases of plague among longshoremen, though the covered quays are great dépôts for all sorts of merchandise, and the number of rats there is greater than elsewhere. I believe the same fact has been observed in New Orleans. The plague has commenced in and has extended along blocks of houses near the wharves, not in the wharves themselves.

I venture to suggest that this is due to the fact that the rats in this section and their holes are constantly wet and therefore relatively free from fleas.

Before the plague appeared in Havana, I had studied the flea population (*cheopis* almost exclusively in our rats) of our rodents, and I was able to confirm the observation made in India, that the fleas diminish about one half during the wet season.

In the great epidemics of Europe, popular opinion was wont to greet with satisfaction the appearance of the first rains, and even religious ceremonies were instituted to invite their on coming. I have no doubt that our work of eradication of plague was much aided by the setting in of the rainy season.

For these reason we have insisted in our recent campaign upon the free use of water in infected buildings. These have been inundated, not with a view to drowning the rats, who are good swimmers, but with the object of wetting them and their runs; an operation which would seriously affect the breeding of fleas.

It was stated in the beginning of the present paper that the comparatively low mortality in our epidemic was to be attributed, in part, to the prompt reporting of cases. To this it might be argued that it was much simpler to attribute this result to the benign character of the infection. I do not believe that the facts warrant this assumption. There is no scientific basis for the assumption that, in recent years, the great epidemic diseases, such as plague, cholera and yellow fever, have become attenuated; and yet, I believe it may be asserted that a lower rate of mortality, in comparison with former times, prevails wherever there is a good sanitary organization. The explanation of this appears to me to be that under the latter conditions, *all* cases of the disease are reported, whether mild or grave. Thus many light cases are diagnosed which were formerly neglected.

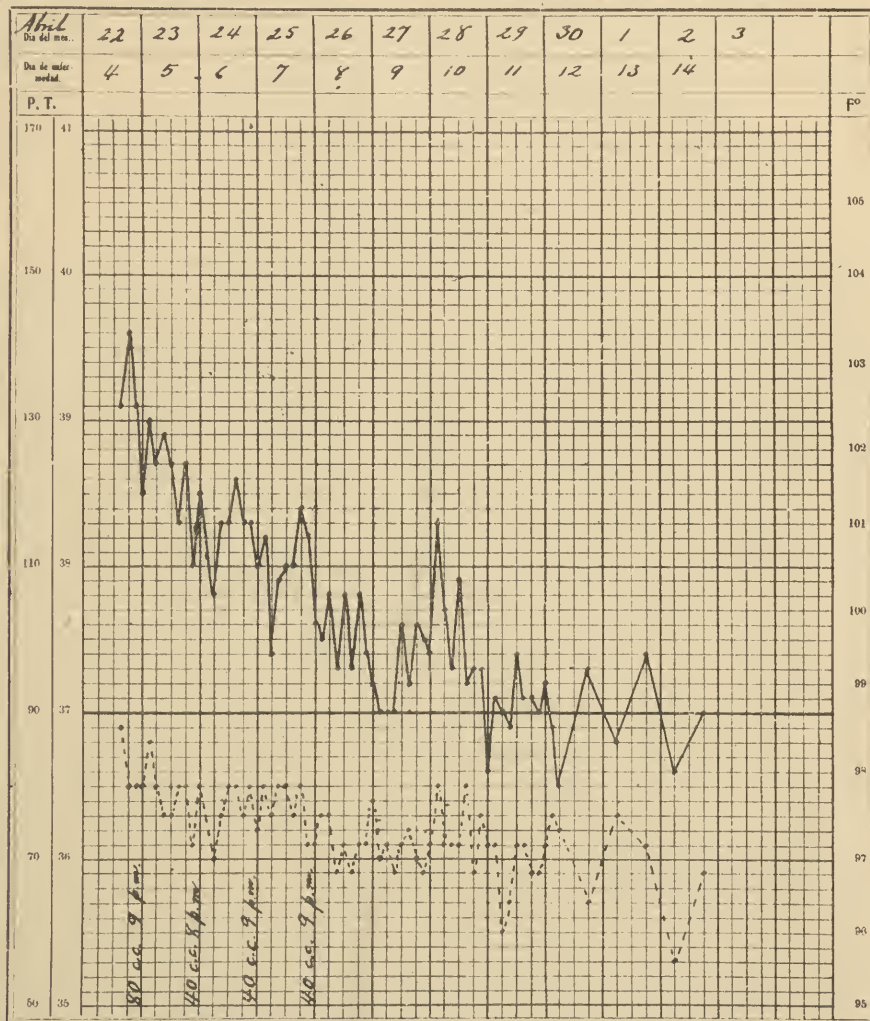
With respect to yellow fever, a disease that I have studied for many years, I have no doubt that this is true. The cases of children, usually mild and difficult to diagnose, were not generally recognised, nor were the cases of so called acclimating fevers classified as yellow fever, where many of them properly belong. As a matter of course, if we only diagnose grave cases, the mortality must be high, and low, on the other hand, when all the mild cases are included.

Dr. R. P. Strong, a great authority in plague, who has acquired his experience mostly in Asiatic countries, expressed to me the opinion that plague was generally of a milder type in America than in Asia. I had the opportunity of showing Dr. Strong, during a short visit he made in Santiago, the temperature charts of our cases in Havana, and he was obliged to acknowledge that they

certainly did not represent a generally mild type of the disease. These are the same charts that appear in the course of this paper. I am not sure, however, that I succeeded in bringing him over to my views, that the difference between the two continents is more apparent than real, and that it is mainly due to the dif-

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CHART N.º 14

ferent attitude of their respective peoples towards the disease. In Asia we have the force of habit, what we may call a resignation to the endemic presence, something similar to the conditions that were prevalent in Cuba with respect to yellow fever, and even certain scruples of a religious character, circumstances

all of which tend towards the occultation of cases, and the non recognition of the mild ones; in America, on the contrary, the disease is a new host, and it appears to me that the effort towards its discovery and eradication is more general, and more in accord with popular sentiment.

The early application of the serum treatment, as may be seen in the following paper, appears to have affected our results favorably.

SERUM TREATMENT OF PLAGUE

By Drs. Juan GUITERAS,

Director of Health

and

Alberto RECIO,

of the Laboratory of Investigations.—Havana, Cuba

Twenty seven cases of plague, have occurred in Havana during the present outbreak, from the 22nd. of February to the 20th. of June. Of these cases six have died. We believe that the results obtained speak favorably for the action of the Paris serum. They evince, likewise, from a sanitary point of view, the success of our efforts in ferreting out cases. We doubt if there be anywhere a more thorough system of inspection and reporting of suspicious cases.

The series of twelve cases treated at Las Animas Hospital, and especially reported in this paper, all recovered, with one exception. None seems to have presented, during the invasion, the characters of unusually mild cases. Some of them were seriously in danger of their lives. The buboes suppurated in all of them but one. The beneficial influence of the serum appears, therefore, all the more striking. Others, however, with greater experience in plague, will be better able to judge of this matter.

In the beginning of the present outbreak, one of us, (Guiteras), as Director of Health, requested of our Laboratory of Investigations that a special study be made of the subject of vaccine and serotherapy in plague. Dr. Recio was selected for this purpose by Dr. Lebrede, and a sufficient quantity of Haffkine's vaccine and Paris serum was provided.

As Dr. Recio worked out the plan of treatment which seemed most appropriate, and as the treatment with its successful results, was instituted under his immediate supervision, not only in the cases here reported, but likewise in a few others treated in another institution, it seems advisable that we leave to him the reporting on the subject.

Dr. Alberto Recio reports as follows:

"Treatment. As far as our present knowledge goes, it appears to be demonstrated that the only successful treatment of plague is to be found in specific serotherapy."

"The real value of the antiplague sera appears, however, difficult to determine with precision, in view of the various statistics published since 1896, the date of the first experiences of Yersin."

“The following Table of Dujardin-Beaumetz shows a marked irregularity in the results obtained by different observers.”

		Treated	Died	Mortality %
	Canton & Amoy, 1896.....	26	2	7.6
Versin.....	Bombay, 1897.....	50	17	34.0
	Nha-Trang, 1898.....	33	14	42.4
	Mandvi, 1898.....	136	89	65.4
Simond.....	Bombay, Karad, Moundra, 1898.....	171	99	57.8
	Kuratchi, 1898.....	75	37	49.3
Zabolotny.....	Mongolia, 1898.....	16	12	75.0
Delay.....	Mongtzé, 1898.....	10	4	40.0
Thiroux.....	Tamatave, 1898-99.....	20	11	55.0
Calmette & Salimbeni....	Oporto, 1899.....	142	21	14.7
Métin.....	Oporto, 1899.....	6	1	16.6
Primet.....	Noumea, 1899-00.....	7	2	28.5
Noc.....	Noumea, 1901.....	17	8	46.9
Auber.....	Réunion, 1899.....	8	1	12.5
Vassal.....	Réunion, 1900-01.....	13	2	15.3
Clarac & Manguy.....	Majunga, 1902.....	71	32	45.0
Rouffiandis.....	Foa-Tchéou, 1902.....	67	34	50.7
	Tonkin, 1903.....	101	51	50.5
Choksy.....	Bombay.....	51	37	72.5
Agote & Medina.....	Rosario.....	26	11	42.3
Penna.....	Buenos Aires 1905.....	204	29	19.3
Del Rio & Zegers.....	Iniique, 1903.....	85	38	44.7
Montero.....	Antofogasta.....	50	3	6.0
Cruzat.....	Chanarai, 1904.....	18	1	5.5
Godinho.....	Santos, 1900.....	19	7	36.8
Duprat.....	Rio Grande, 1902.....	45	7	15.5
	Rio Janeiro, 1900.....	410	138	33.6
	Rio Janeiro, 1901.....	278	99	35.6
	Rio Janeiro, 1902.....	268	68	25.3
	Rio Janeiro, 1903.....	541	124	22.9
	Rio Janeiro, 1904.....	504	103	20.4
	Rio Janeiro, 1905.....	149	25	16.5
	Rio Janeiro, 1906.....	187	54	28.8
	Campos, 1902.....	136	27	19.1
Tavares de Macedó.....	Campos, 1906.....	14	2	14.2
A. Ferrari.....	Rio Janeiro, intravenous 1907.....	69	5	7.2

“The influence of epidemic modalities, of race, of age, of sex, have been discussed as explanations of these differences. Though the influence of some of these factors may not be denied, the study of the conditions under which these various experiences were obtained would lead us to consider other circumstances as affecting the value of serum therapy in plague. Thus Zabolotny had 12 deaths in 16 cases of pneumonic plague treated by serum in Mongolia, in 1898, or 75%, while Tavares in the Campos epidemic (1906) lost but 3 out of 15, though 7 were pneumonic. In this same epidemic, out of 4 cases without treatment, 3 died of pneumonia, or 75%.”

“Zabolotny used small doses hypodermically; Tavares employed much larger doses intravenously.”

“The antiplague serum, as we have employed it, has given satisfactory results. One death in 12 cases at Las Animas Hospital gives us a mortality of 8.33%. The fatal case was treated with rather small doses, intravenously, on the third day. See chart N.º 24. One of the twelve cases was not treated by serum.

Beside the 11 cases thus treated at Las Animas we have treated 7 cases, also of the bubonic form, at Covadonga hospital, with two deaths; a mortality of 28.57%. These 2 cases may be excluded from the statistics if we consider that one of them (chart N.º 17) was admitted in a state of great gravity, about the fourth day of the disease, and died three hours after the administration of the serum. The second fatal case (chart N.º 21) did not present, at the time of admission, symptoms sufficiently characteristic of plague, and was overlooked, until the third day after admission and fourth day of the disease.

“Among the several causes that may have contributed to this success, the most important ones seem to be: First, the day of the disease in which the treatment is instituted; Second, the quality of the serum; Third, size of the doses, and intervals between them; Fourth, manner of introducing the serum.”

“First: Day of the disease. The importance of this has been shown by Simond in India, in 1898. The mortality among the patients receiving the serum in the 1-2 days was 20%; in the 3rd. day, 36%; in the 4th. day, 66%; in the 5th. day 100%.”

“The following Table shows the results obtained by Choksy in Bombay.”

DAY OF THE DISEASE	Number of cases	Died	Recovered	Pert cent
1st. day	323	98	225	30.3 %
2nd. day	311	164	147	52.7 „
3rd. day	248	155	93	62.5 „
4th. day	106	60	46	56.6 „
5th. day	52	32	20	61.5 „
6th. day	14	8	6	57.1 „
7th. day	4	4	0	100. „

“We have endeavored, therefore, to establish the specific treatment immediately after the confirmation of the diagnosis.”

“If we compare charts N.º 15 and N.º 16, corresponding to cases of about the same intensity, we find that the administration of the serum on the 2nd. day of the disease in the former, brings down the temperature on the third day, whereas in the latter the fall is postponed to the fourth. Convalescence is established on the fourth day in Case N.º 15, and not until the seventh in Case N.º 16.”

“Analogous observations may be made in other comparable cases.”

“Second: The quality of the serum. Deficient knowledge in serotherapy at the time when the earlier experiments with antiplague serum were made (1896) probably accounts, in part, for the contradictory results at first obtained. The first sera were taken from horses that were incompletely immunized or prematurely bled. The activity of the sera was, therefore, not fully developed.”

“Yersin in Bombay (1898) had 17 deaths in 50 cases treated, (34%). In a second series of 19 cases in the same epidemic he was obliged to use incompletely immunized horses, and the death rate rose to 72%. With a serum prepared under better conditions he saved in Kutch-Madyi 24 cases out of 58. The same improvement in the results may be observed in the table published above with the cases treated in successive years by G. Cruz in Rio.”

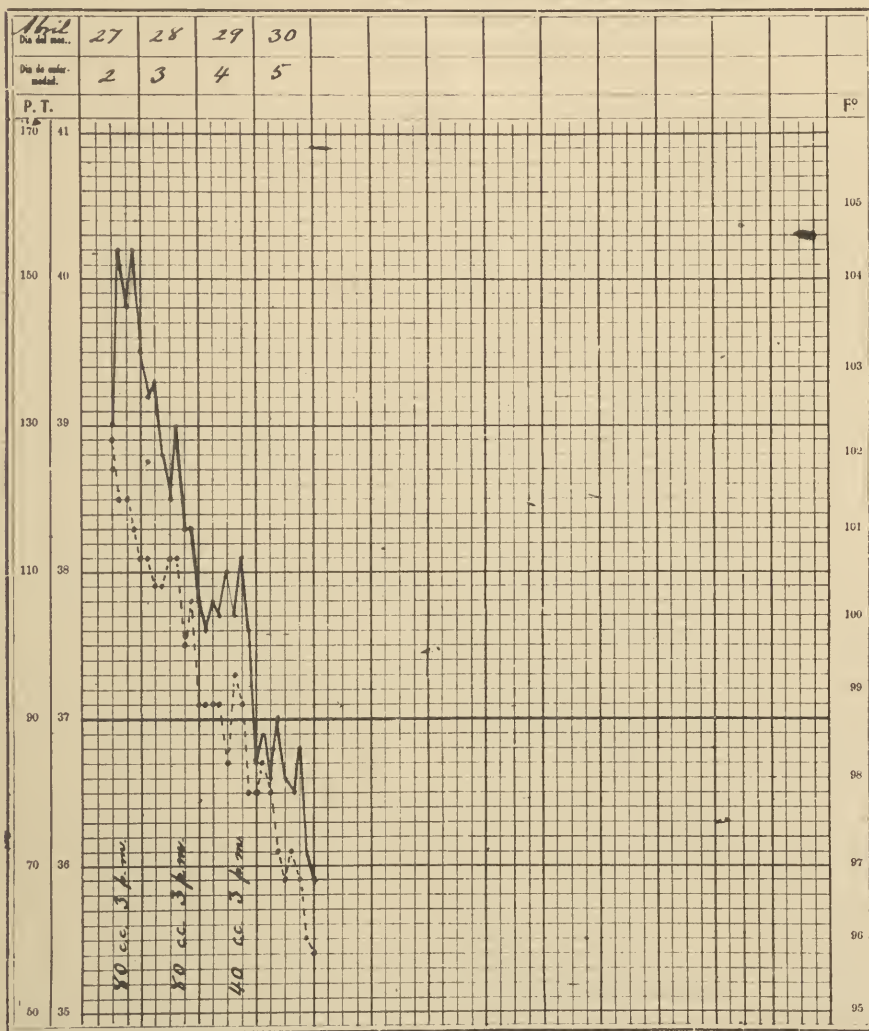
“The serum that we have employed has shown itself to be sufficiently

active, and when applied opportunely, and in sufficient doses, has never failed to give evidence of its action."

"Third: Doses and length of interval between them. In the threatment

HOJA CLINICA

Nombre, *José Sande*, Ocupación, *Obrero*, Edad, *20 años*, Color, *Blanco*.
 Natural de *Cuba*, Enfermedad, *Peste bubónica*



Hospital Las Animas.

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CHART N.º 15

of our cases we have always employed large doses, at intervals of 6, 12 and 24 hours, according to the necessities of the case."

"The foundation of this procedure we have based on the character, opsonic in the main, of the antiplague serum. The sera that we are now employing are highly opsonic, but the intensity of their action may not be compared, the vo-

lumes being equal, to that of antitoxic sera (diphtheria, for instance), as we cannot compare the merely sensibilizing action of opsonins with the neutralizing action of antitoxines. In other words, we should not expect from anti-endotoxie sera the rapid effects of the antitoxic; and if it be necessary to obtain such results, we must raise the dose and shorten the intervals. By this method alone can we supply the sufficient amount of opsonines for the phagocytosis which should proceed rapidly throughout the organism."

"From such reasoning Duprat, in Rio Grande do Sul, in 1902, was led to experiment with larger doses. He used, as a first dose, and according to the gravity of the case, from 200 to 300 c. c. subcutaneously. He continued with doses of 100 to 150 c. c. every 12 hours. He obtained 38 cures in 45 cases treated, a mortality of 15.5%."

"With regard to the intervals, we should be guided by the course of the temperature and the general condition of the patient."

"Choksy employs the Lustig serum, and he recommends the following procedure:"

"1st. Injection of 60, 80 or 100 c. c. as soon as the diagnosis is made. For children under 12 years, 10 c. c. An injection of 20 or 30 c. c. intravenously, as recommended by Calmette may be employed."

"2nd. Injections are applied in the morning and repeated at the end of twenty four hours. If the patient is seen first in the afternoon, the injection should be made at once and repeated the following morning."

"3rd. The amount of serum to be injected subsequently will depend upon the rise of the temperature the previous evening, and the general condition of the patient. If the temperature be the same as on the first evening, the same amount may be injected; if it be lower, 30 c. c. or less should be injected."

"4th. The quantity of serum injected should be lessened gradually, until the temperature falls to the normal in the mornings."

"5th. A sudden fall of the temperature between the second and the seventh day should not indicate a suspension of the treatment."

"6th. The injections are given every 12 hours if secondary buboes present themselves, or if the temperature rises rapidly one or two degrees."

"7th. If the evening temperature be lower than that of the morning, the dose is reduced on the following day."

"8th. From 6 to 8 injections are generally sufficient to complete the treatment."

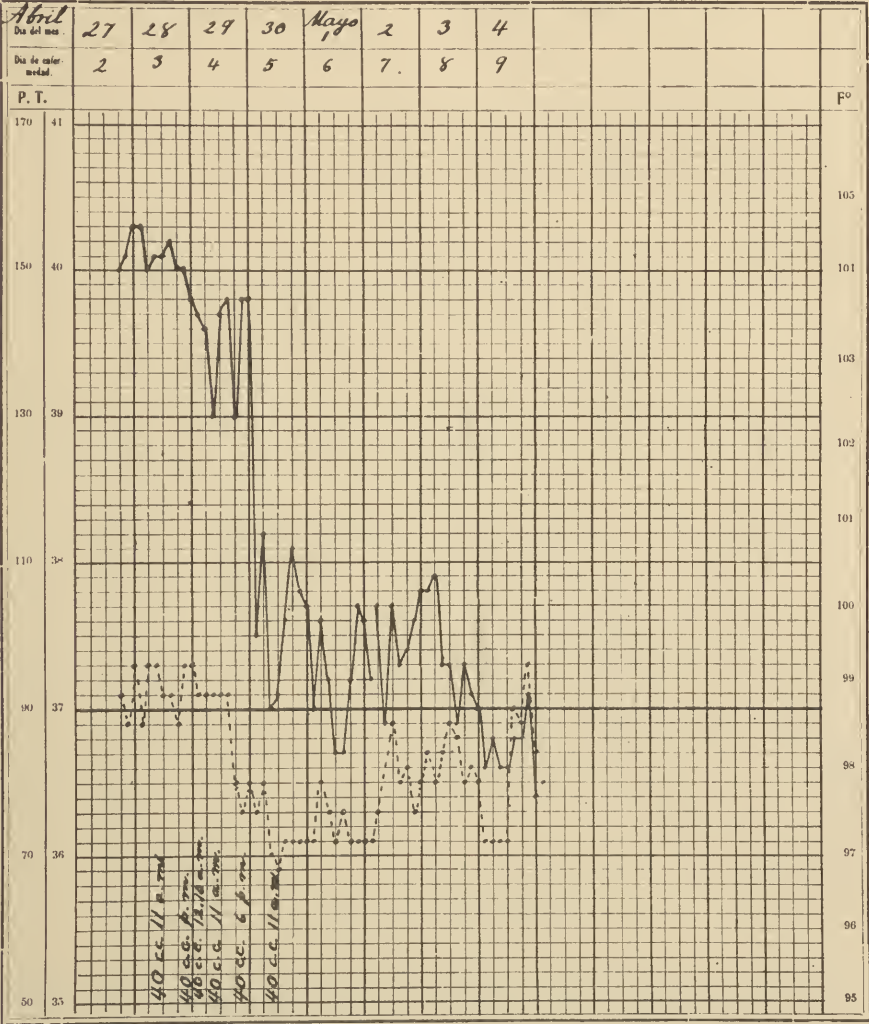
"9th. The total quantity of serum required varies between 150 and 300 c. c. according to the gravity of the symptoms and the conditions of the serum."

Fourth: Method of introduction of the serum. The hypodermic method has been the one most generally employed. The intraperitoneal method employed by C. Fontes in Rio Janeiro, in the case of children and others where the intravenous method could not be used, has given better results than the subcutaneous, but not as satisfactory as the intravenous. This is demonstrated by the following statistics of A. Ferrari:"

METHOD	Cases treated	Died	Death rate
Subcutaneous	21	8	38.
Intraperitoneal	11	2	18.
Intravenous	69	5	7.2

HOJA CLINICA

Nombre, *Domingo Govín*, Ocupación, *Forrapero*, Edad, *34 años*, Color, *Blanco*
Natural de *Cuba*, Enfermedad, *Peste bubónica*



Hospital Las Animas.
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CHART N.º 16

“The intravenous method is undoubtedly the most rational procedure for the introduction of the antiplague serum. The rapid evolution of the plague infection; the tendency of the germ to invade rapidly the lymphatic system and even the circulatory torrent, require the promptest introduction of the opsonins

if we wish to prevent the generalization of the process. The absorption through the other channels is slow; and the opsonins should be provided at once to meet the active invasion of the pest germ."

"It may well be said that the true value of the antiplague serum was not recognised until the intravenous method was employed. Calmette and Salimbeni were the first to apply this procedure in the Oporto epidemic of 1899. Out of 142 cases treated they lost only 21. This gives a death rate of 14.7, which is quite low when we consider that a number of the cases were pneumonic. Similar results were obtained by this method by Metin, by Penna and others as may be seen in the table above quoted."

"Method followed in our cases. With the exception of some symptomatic indications, our treatment has consisted in the intravenous injection of large doses of serum, under the following rules:"

"Injection into the vein of 80 c. c. *immediately* upon the confirmation of the diagnosis."

"Repetition of the same dose six hours later if the fall of the temperature be not initiated. If this has occurred we delay the injection twelve hours."

"If the descent continue, the next dose of 80 c. c. is given twenty four hours later."

"Subsequent doses of 40 c. c. are given every twenty four hours until the temperature is brought completely under control."

"The treatment is discontinued when the temperature oscillates around the normal, unless called for by a renewed tendency to rise."

"The total amount required may vary between 200 and 600 c. c."

"We find in some cases that the temperature, after the lysis which occurs between the 3rd. and the 5th. days, rises once more in irregular oscillations. The renewed injection of the serum fails to effect the results that obtained in the beginning. This phenomenon, which should be attributed to secondary infections or other causes, must be considered with a view to the discontinuance of a treatment which might be inopportune. Chart no. 13 corresponds to a case treated in the Covadonga hospital. We may here follow the development of a unilateral pneumonia of secondary origin, with thermic elevations which fail to respond in the manner that we observe in the earlier stages of the disease during the pest infection proper. The same observation may be made in chart no. 20, a woman affected with a secondary pelvic complication."

"The effects of the antiplague serum are noticeable upon the temperature, upon the general condition of the patient, and upon the lesions."

"Effect upon the temperature. In the majority of the cases, the first injections are followed by an elevation of the temperature in from a half to one hour. The rise may vary between three tenths and one degree Centigrade. This phenomenon may be attributed to the brusque liberation of bacterial toxo-proteines, and seems to be proportional with the amount of the dose. The reaction is most marked with the first injections and seems to disappear as the processes of active immunization become established. Two or three hours after the initial rise we observe in all cases a remission of from a few tenths to two degrees Centigrade. This fall is transitory and is followed in the next twelve or twenty four hours by an exacerbation. If the injections are continued, the temperature will fall

desired effect in such cases may be obtained by an increase of the dose, or by its repetition at the end of a period of six hours."

Action upon the general condition of the patient. With the high temperatures the patient is generally somnolent. As soon as the temperature falls after the first dose, the patient becomes more lively for a time, to return once more to the characteristic state of depression. This gradually disappears as the temperature falls towards the normal. The later injections are followed by a feeling of relief."

"The local lesions. The effect upon the buboes is shown in the disappearance of the spontaneous pains, the softening of the tumor, and the establishment of suppuration. This has been the rule in our cases."

"Seric accidents. The knowledge we have of the toxic character of heterologue sera prepares us for such accidents in the course of a treatment that requires such enormous doses. Of the eleven cases treated with serum, at Las Animas Hospital, three presented this complication; but the gravity of it did not exceed what we meet with in connexion with the use of anti-diphtheric serum, nor can it be said that the intensity of the manifestations seemed to be influenced by the size of the dose."

"Both the early and the late manifestations of serum disease were seen in our cases, and likewise, phenomena of anaphylaxis."

"The patient Granda, chart no. 6, showed, immediately after the first injection of 80 c. c., a general erythema, without pruritus or other manifestations. This disappeared rapidly, and did not recur with the subsequent injections."

"In Case no. 10, we met with the late manifestation of the serum disease. The treatment had commenced in the third day of the disease. The patient was in the seventh day after the first injection, and in the forty eighth hour after the last. Suddenly the temperature, which had fallen on the sixth day, and was normal in the mornings, rose in the evening to 39.8. In the belief that we were dealing with a relapse, a dose of 80 c. c. of serum was administered. This was followed by increased malaise, dyspnoea, vomiting, severe urticaria with intense itching, and increase of the albuminuria. The temperature falls one degree during the night to rise once more to 39.9 on the following day. On the evening of the second day of the accident, the fever falls to the normal. The urticaria and the other symptoms gradually disappear. After another slight elevation of the temperature, convalescence is established."

"The phenomena of anaphylaxis were observed in the case of Santisteban (N.º 7). The patient had never been injected with horse serum. The incubation of the hypersensibility was of short duration, (fourth day). The patient was a severe case of plague in the ninth day of the disease, seven days removed from the first injection, and four from the last. Upon noticing an elevation of the temperature, a dose of 40 c. c. was administered intravenously. Five or ten minutes later, we observed signs of suffocation, anguish, small and rapid pulse, general cyanosis, nausea and vomiting. All these symptoms disappeared in about one hour with a profuse perspiration and no other consequences, except some depression."

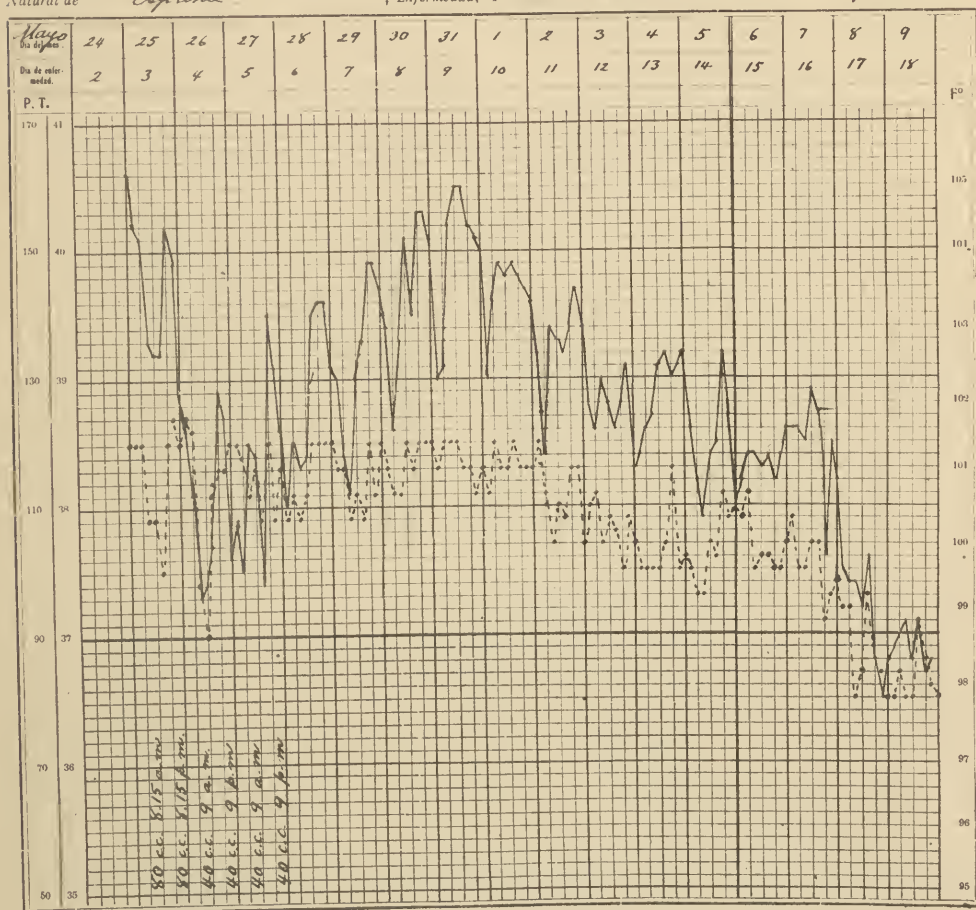
"Prevention and treatment of the seric accidents. Our patients are given regularly 2 grams of chloride of calcium in the 24 hours during the continua-

tion of the serum treatment. We believe that by this method the accidents are frequently prevented, or are made very slight."

"With a view to prevent the phenomena of anaphylaxis we always inquire if the patient has been sensibilised by some previous injection. If there be any suspicion that such is the case, we inject a preliminary dose of 1 c. c. subcutaneous."

HOJA CLINICA

Nombre, *Pura Alonso*, Ocupación, *Lavandera*, Edad, *32 años*, Color, *Bl.*, Color,
Natural de *Espana*, Enfermedad, *Peste bubónica*



Hospital Las Animas.

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CHART N.º 20

ously, to be followed 6 hours later by the large dose. The same procedure is employed when we have to give an intravenous injection after an interval of 5 days since the previous one."

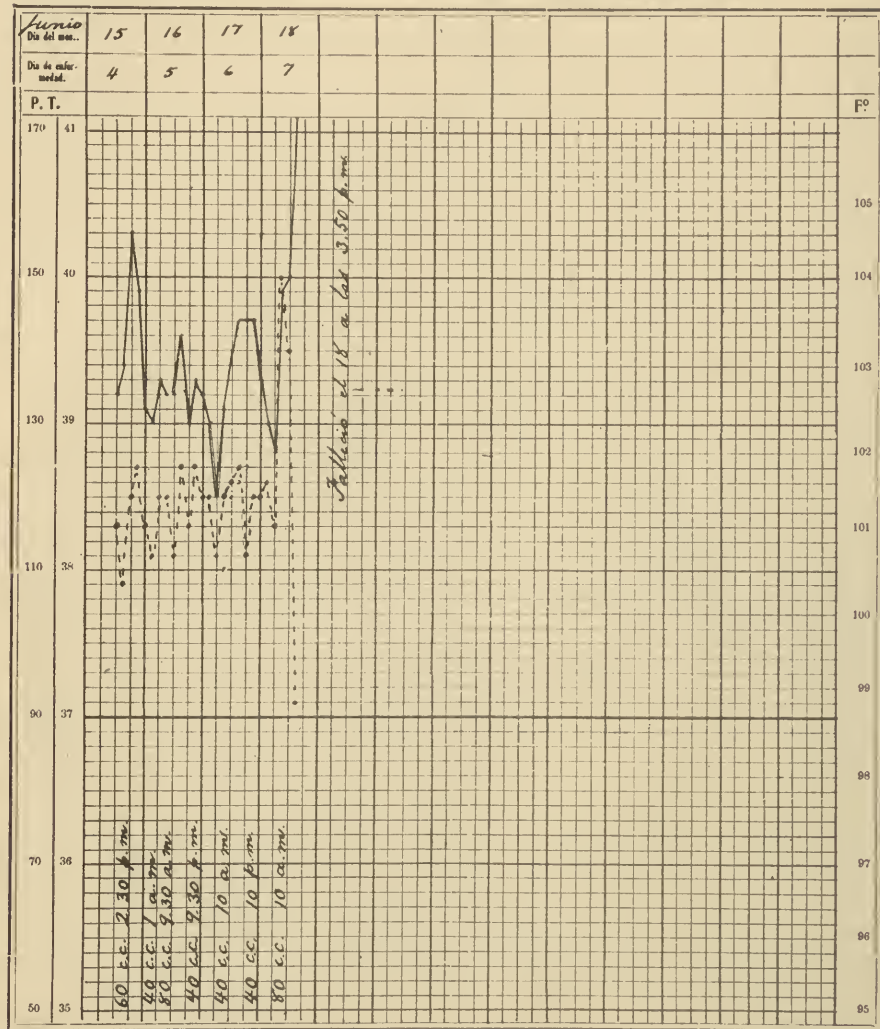
"On the appearance of the first symptoms of the serum disease, an increase of the dose of chloride of calcium, and the administration of a cold enema have been found sufficient to control the symptoms. The fever, the exanthema and the albuminuria which characterize the later manifestations are combatted by

enemas, purgatives and the administration of 1 or 2 milligrams of adrenalin hypodermically."

"The anaphylactic shock did not give time for treatment in the case in

HOJA CLINICA

Nombre, Luis Garrido, Ocupación, Herrador, Edad, 22 años, Color, Mestizo
 Natural de Cuba, Enfermedad, Paté butónica



Hospital Las Animas.

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CHART N.º 24

which we observed it. If necessary we would employ ergotin or adrenalin for the vaso-motor disturbances, and strychnin for the cardiac collapse."

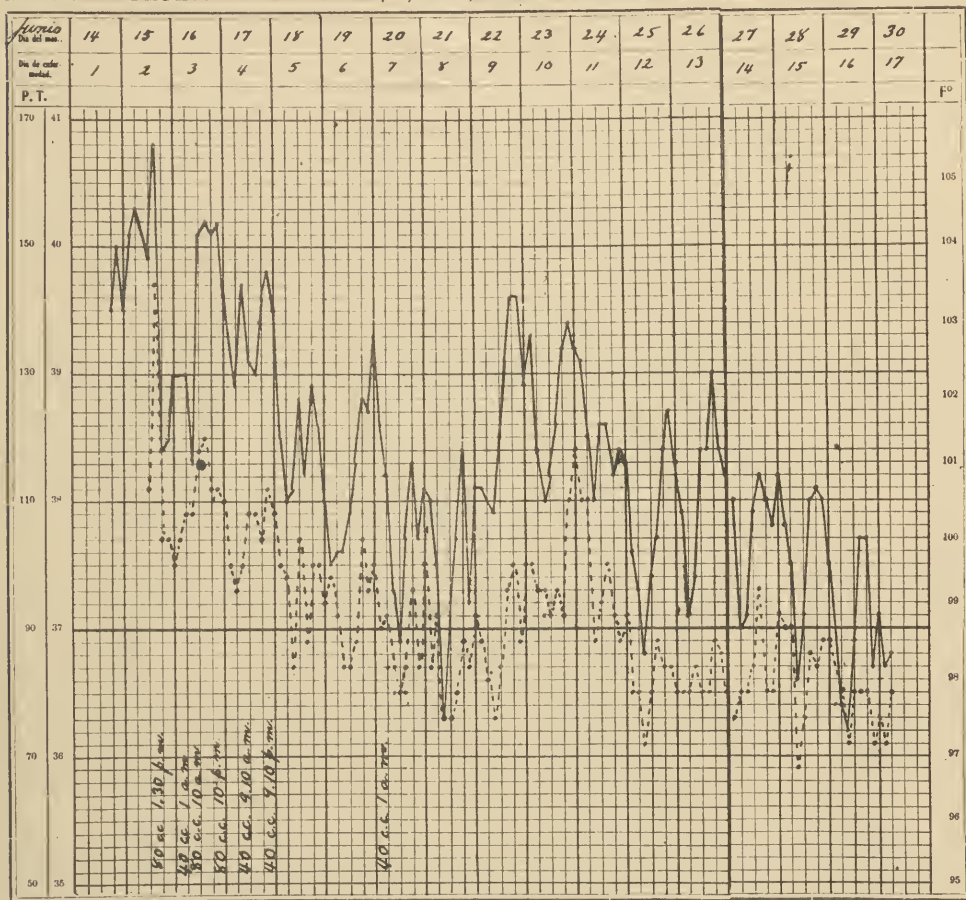
We do not fail to recognize the fact that perhaps the number of our cases is not sufficient for us to insist upon the details of the action of the serum in modifying the daily oscillations of the temperature in a disease the course of

which is naturally subject to rather irregular movements; but we report what we have observed, and insist upon the importance of the final results obtained in a series of unselected cases.

Of the 15 cases treated outside Las Animas Hospital, 8 of them were under the supervision of one of us (Recio) in another institution. One of these, chart

HOJA CLINICA

Nombre, *Julio C. Gotilla*, Ocupación, *Dependiente*, Edad, *29 años*, Color, *Blanco*, Color, ...
 Natural de *Cuba*, Enfermedad, *Peste tubérica*



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CHART N.º 25

N.º 13, is given as a complicated case. The remaining 7 cases were treated in another hospital.

With 4 exceptions, the 27 cases were treated with intravenous injections of serum. Very rarely hypodermic injections were employed. One of the four exceptions was a very mild case in which the diagnosis was made by guinea pig inoculations some time after the symptoms had subsided. The other two were cases of *peste minor* which did not require treatment, and the fourth was a

violent septicaemic case (chart N.º 5) in which bacilli were easily found in the blood twenty four hours after the invasion.

The failure of the serum treatment in other fatal cases, is in part, accounted for in the course of the paper. In case N.º 8, an old serum was employed, imported in 1912.

The cases at Las Animas Hospital were subjected to the following regime, beside the measures already indicated for the prevention of serie complications. Three or four ounces of milk with lime water were given every three hours. The bowels were not disturbed by purgatives. A soap enema was given if they did not move in three or four days. Insufficiency of the kidneys was treated in three of the cases with small doses of calomel; not for a longer time than one day. Good results were obtained with small doses of laudanum as a stimulant. Strychnia and small doses of cognac were also employed. Convalescents were given wine and nourishing diet.

The charts of all the cases are herewith published. At Las Animas hospital the temperature and pulse are given every three hours. The respiration is also given in the complicated case presenting a secondary pneumonia.

SUMARY OF CASES: HOSPITAL LAS ANIMAS

Cases treated with serum	Died	Death rate	Not treated with serum	Died	Death rate
11	1	9.09	1	0	0
Total... 12	1	8.33%			

HOSPITAL LA COVADONGA

Cases treated with serum	Died	Death rate	Not treated with serum	Died	Death rate
7	2	28.37	1	0	0
Total... 8	2	25. %	1		

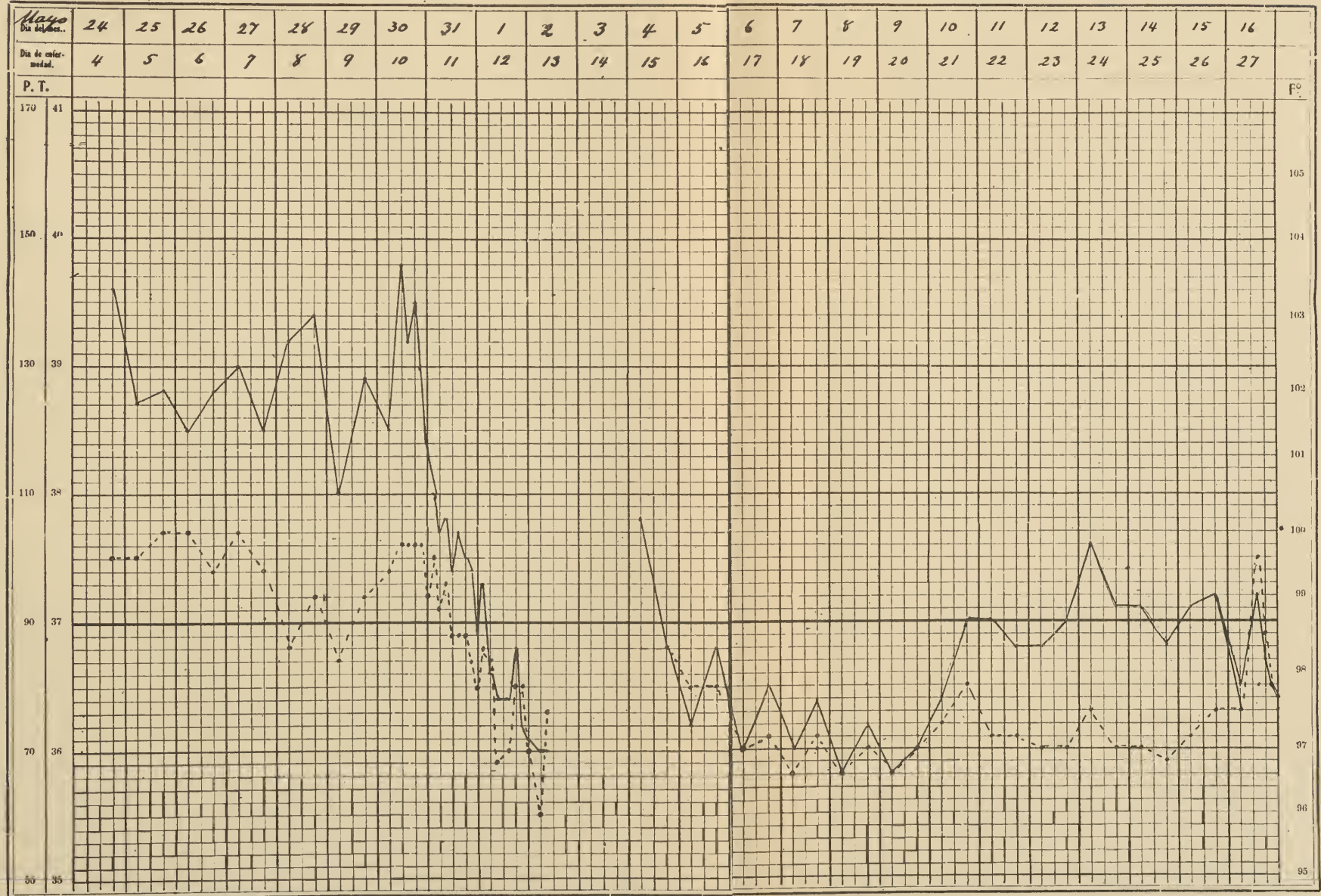
HOSPITAL DEPENDIENTES

Cases treated with serum	Died	Death rate	Not treated with serum	Died	Death rate
5	2	40.00 %	2	1	50.00 %
Total... 7	3	42.86 %			

HOJA CLINICA

HOJA CLINICA

Nombre, Adolfo Rodriguez Ocupación, Dependiente, Edad, 21 años, Color, Bl, Ocupación, _____, Edad, _____, Color, _____,
 Natural de España, Enfermedad, _____, Enfermedad, _____

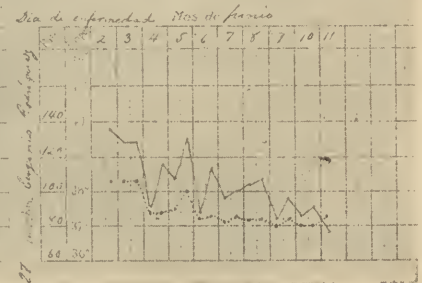
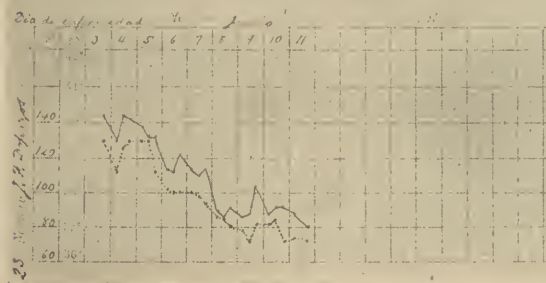
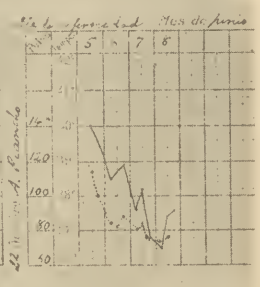
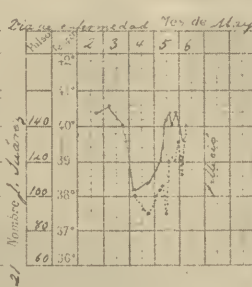
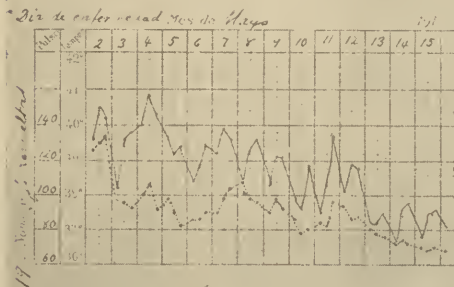
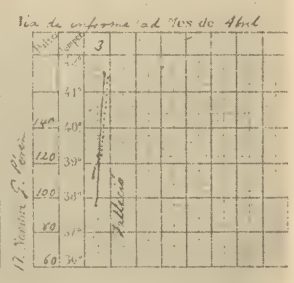
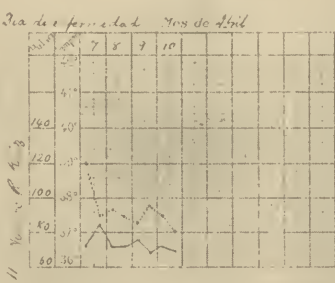
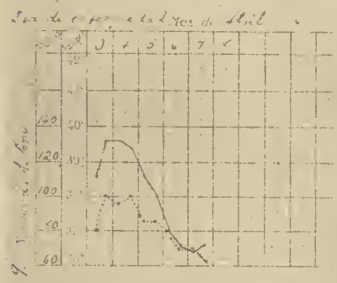
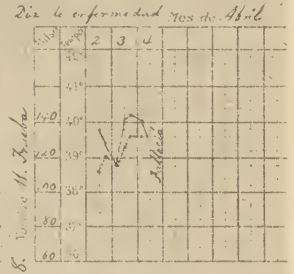
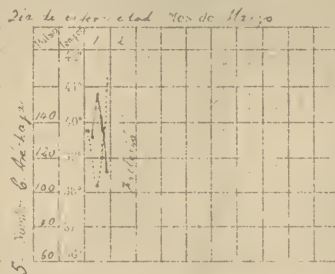
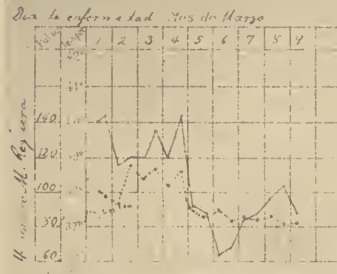
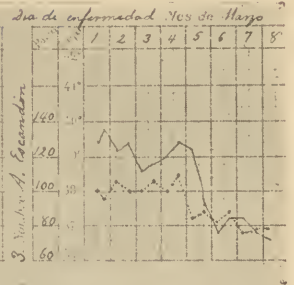
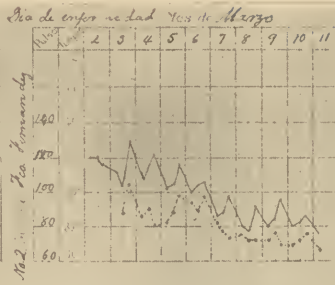
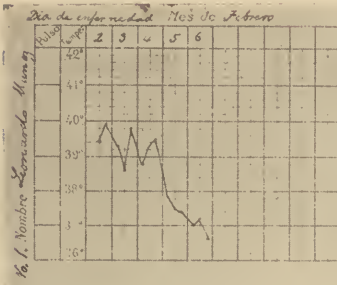


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CASES SUBJECT TO OUR TREATMENT (1)

Cases treated with serum	Died	Death rate	Not treated with serum	Died	Death rate
18	3	16,66%	2 (1)	0	0
Total... 20	3	15,0%			

GENERAL TOTAL

Number of cases	Died	Death rate
27	6	22,22%

(1) The two untreated cases were cases of pestis minor.

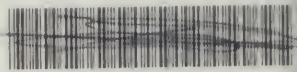
CASES OF PLAGUE OCCURRING

AT SANTIAGO DE CUBA AND CANEY

No.	NAME	Race	Age	Nationality	Occupation	Place of infection	Domicile	Hospital	Date of invasion	Date of confirmation	Date of termination
1	Patricio Alvarado	W	26	Spain	Groceries	Abascal Store	Abascal Store	Colonia Española	Jun. 22	Jul. 7	Disch. Jul. 13
2	Feliciano Alvarez	W	23	do.	do.	Cristina B. 5	Cristina B. 5	Civil Hospital	Jul. 11	Jul. 28	do. Aug. 28
3	Magin Galan	W	33	Cuba	Baker	Maso B. 52	Maso B. 52	do. do.	Jul. 13	Aug. 1	do. Aug. 17
4	Teresa Caraballo	W	22	do.	Household	Cristina B. 55	Cristina B. 55	Domicile	Jul. 17	Jul. 27	Died Jul. 19
5	José Guardado	W	20	Spain	Groceries	Marina B. 31	Marina B. 31	Colonia Española	Jul. 22	Jul. 28	Disch. Aug. 28
6	Caridad Maury	W	27	Cuba	Household	Marina B. 35	Marina B. 35	Civil Hospital	Jul. 22	Jul. 30	do. Sep. 3
7	Jose Blanco	C	25	do.	Corporal	Moncada H'quarters	Moncada H'quarters	Cayo Duan	Jul. 25	Aug. 9	do. do. 5
8	Aurelio Calzado	W	16	do.	Tabacco	Marina B. 31	Marina B. 31	Civil Hospital	Jul. 27	do. 1	do. do. 3
9	Maria Muñoz	C	28	do.	Household	El Aceite	La Tienda.	do. do.	Jul. 27	do. 5	do. Aug. 17
10	Miguel Sojos	C	27	do.	Groceries	do.	do.	do. do.	Jul. 31	do. 3	Died. do. 7
11	José Sarmiento	W	21	do.	Farm -r	do.	Same neighborhood	do. do.	Jul. 31	do. 5	Disch. do. 17
12	Rogelio Nuñez	C	7	do.	Household	do.	La Tienda	do. do.	Aug. 2	do. 3	do. do. 28
13	Juan Bernudez	W	24	do.	Corporal	Moncada H'quarters	Moncada H'quarters	Cayo Duan	do. 3	do. 10	do. Sep. 9
14	Manuel Perez	C	9	do.	Household	Maceo B. 28	Maceo B. 28	do. do.	do. 10	do. 13	Died. Aug. 13
15	Emilio Chauvin	W	35	do.	Employe	Caney	Caney	do. do.	Sep. 13	Sep. 17	Disch. Oct. 5
16	Pedro Mojena	C	14	do.	Household	Vargas 3	Vargas 3	Home	Sep. 13	Sep. 19	Died. Sept. 17

CASES OF PLAGUE OCCURRING H A V A N A

No.	NAME	Race	Age	Nationality	Occupation	Place of infection	Domicile	Hospital	Date of invasion	Date of confirmation	Date of termination
1	Leonardo Muñoz	W	21	Spain	Groceries	Oficios 1	Oficios 1	Dependientes,	Feb. 22	Mar. 10	Disch do. 12 Mar. 30
2	Francisco Fernández Núñez	W	28	do	do.	Id. 5 ^s	Somermelos 17	do.	do. 27	do. 3	do.
3	Antonio Escandón	W	42	do	do.	San Ignacio 114	San Ignacio 114	Covadonga	Mar. 24	do. 26	April 26
4	Marcelino Riguera	W	28	do.	do.	do. do.	Id. id.	do	do. 24	do. 26	May 10
5	Carlos Arechaga	W	12	do.	do.	do. do.	Id. id.	Dependientes,	do. 24	do. 26	Died do. 26
6	Victoriano Granda	W	20	do.	do.	do. do.	Id. id.	Animas,	April 9	April 14	Disch do. 17
7	José Santisteban	W	22	do.	do.	Inquisidor 10	Id. 12	do.	do. 10	do. 14	do. 11
8	Marcelino Trueba	W	19	do.	do.	do. do.	Inquisidor 25	Dependientes,	do. 10	do. 12	Died April 14
9	Luis A. Con	W	21	do.	do.	do. do.	Id. id.	Covadonga.	do. 10	do. 14	Disch May. 3
10	Heliodoro Rodolfo	C	29	Cuba	Seavanger	City Stables	Tenerife 2 ^s	Animas.	do. 13	do. 18	Jun. 1
11	Ranón Ruiz Gómez	W	14	do.	Groceries	Inquisidor 3	Obispo 17	Covadonga.	do. 13	do. 30	May. 14
12	Ramiro Castro	W	48	do.	Harnesser	City Stables	Carretera Güines,	Covadonga.	do. 15	do. 22	do. 25
13	Gabriel Prieto	W	20	Spain	Groceries	Artemisa	Artemisa	Animas.	do. 18	do. 22	do. 24
14	Miguel Mateo	N	23	Cuba	Drayman	City Stables	Lealtad 224	Covadonga.	do. 18	do. 23	do. 29
15	José Saude	W	20	do.	Sanitation	Id. id.	San Carlos 55	Animas.	do. 25	do. 28	do. 11
16	Domingo Govin	W	34	do.	Stable hand	Id. id.	Omoa 41	do.	do. 25	do. 28	do. 25
17	Gumersindo Pérez	W	38	Spain	Groceries	Baratillo 1	Baratillo 1	Covadonga.	do. 26	do. 30	April 30
18	Juan Valdés	C	31	Cuba	Fruit vender	City Stables	Sittos 107	Animas.	May 2	May 6	Jun. 30
19	Juan Revuelta	W	16	Spain	Groceries	Vapor Market 6 ^s	Vapor Market 6 ^s	Dependientes,	do. 12	do. 14	Jul. 5
20	Pura Alonso	W	32	do.	Washerwoman	Oficios 72	Oficios 72	Animas.	do. 23	do. 25	do. 17
21	José Suárez Álvarez	W	15	do.	Groceries	Justiz 1 (?)	Justiz 1	Covadonga.	do. 24	do. 27	Died May. 30
22	Aurelio Riancho	W	52	Cuba	do.	Salud 89	Salud 89	Dependientes	Jun. 3	Jun. 10	Jun. 10
23	Juan Fernández Dopazos	W	18	do.	do.	Id. id.	Id. id.	do.	do. 5	do. 10	do. 30
24	Luis Garrido	C	22	Cuba	Horseshoer	Concha 2	1 ^s y 21 Vedado.	Animas.	do. 12	do. 16	Died Jun. 18
25	Julio Cotilla	W	29	do.	Groceries	S. José de las Lajas	San José de las Lajas	do.	do. 13	do. 16	Disch Jul. 17
26	Adolfo Rodríguez	W	21	Spain	do.	Oficios 66	Aguilar 100	do.	May 20	do. 22	Jun. 30
27	Eugenio Rodríguez	W	20	do.	do.	Mercaderes 39	Mercaderes 39	Covadonga.	Jun. 20	do. 22	Jul. 18



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